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(54) ALIGNMENT INDICATOR FOR PORTABLE ELECTRIC DRILLS

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(62) PI 6420

(57) Claim Within a portable electric drilling machine, a device utilizing an infra-red reflective electronic component forming part of an electronic circuit, and a non-reflective disc with reflective strips distributed uniformly around the circumference, the said disc, weighted to act as a pendulum and free to rotate about a pivot indirectly fixed to the drill body, remaining in a fixed attitude relative to the earth's surface, moves relative to the said infra-red reflective component of the electronic circuit, causing a light emitting diode to be illuminated whenever one of the said reflective strips passes in close proximity to the said infra-red reflective component.

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P/00/012

PATENTS ACT 1952

## PETTY PATENT SPECIFICATION

(ORIGINAL)

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1. This form is used to describe the invention in full, and the best method of performing it known to the applicant.
  2. The description is to be typed on as many sheets of good quality A4 International size paper as is necessary and inserted inside this form.
  3. A single claim defining the invention must start on a new page. If there is insufficient space on this form for the claim, use separate sheets of paper beginning with the words "The claim defining the invention is as follows " and ending with the date and the name of the applicant in block letters.
  4. This form must be accompanied by (a) a true and exact copy of the description, claim and drawings (if any), and (b) an additional copy of the claim.
- (see formal requirements in the Guide for Applicants for Patents)

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Petty Patent Specification for the invention entitled:

ALIGNMENT INDICATOR FOR PORTABLE ELECTRIC DRILLS

The following statement is a full description of this invention, including the best method of performing it known to me:—

The present invention is directed to a device for sensing whether the axis of the drill bit in a portable drill is in the true vertical plane, the true horizontal plane or inclined at some predetermined angle to either plane.

On some known portable drills, the method of determining whether the drill axis is horizontal is by means of a "bubble level". For this method to be accurate, the operator's eye must be directly above the "bubble", the illumination must be reasonably good, and the operator's eye sight must be reasonably acute.

10 The primary object of the present invention is to provide a novel electronic means of determining (and indicating) when the drill axis of a drilling machine is, within acceptable tolerances, coincident with the horizontal or vertical plane, or at some predetermined angle from either plane. The indication of coincidence is by the illumination of a light emitting diode, fitted to the drilling machine in such a position as to be visible to the operator under all normal operating conditions. This light emitting diode will have a  
20 wide viewing angle and be bright enough to be visible under adverse lighting conditions, thereby overcoming the disadvantages of the "bubble level" device.

The present invention consists of an electronic module(A, Fig.1) and an indicating light emitting diode (B, Fig.1).

The mechanical construction of the electronic module is shown in Fig.2.

It consists essentially of a printed circuit board (E, Fig.2), to which are connected the circuit components, including the opto-electronic reflective sensor(B, Fig.2).  
30 This is a commercial device containing an infra-red diode and a phototransistor mounted in a plastic housing. Whenever a body with a reflective surface is brought into close proximity to the top surface of this device, the infra-red radiation is reflected onto the phototransistor, causing it to become forward biased.

Mounted on a suitable axle, and free to rotate, is a disc(C, Fig.2), with a non-reflective surface facing the opto device. On this surface are placed narrow reflective  
40 strips (D, Fig.2), suitably spaced to suit the alignment require. [Four strips, as shown in Fig.2, will indicate all coincidences of the horizontal and vertical plane.]

The disc is made to act as a pendulum by the addition of weight (A, Fig.2). The circuit board, with the reflective sensor, is fixed to the body of the drill. As this is rotated, the optical sensor moves relative to the reflective strips, causing the indicating LED to light whenever the

sensor detects the proximity of one of the reflective strips.

50 The present invention is suitable for either an A.C.mains powered drill or a battery powered drill, with only minor variations to the circuit.

The circuit for the A.C. version is shown in Fig.3, and the battery version in Fig.4.

The operation of the circuit of Fig.3 is as follows -

60 R1, C1 and D1 form a voltage divider, half wave rectifier. With the non-reflective surface of the disc facing the sensor(U1), there is no coupling of the infra-red radiation between the diode and phototransistor. Q1 is forward biased and effectively short circuits the indicator, LED1.

When a reflective strip is sensed, (i.e. the drill body is coincident with either the vertical or horizontal plane) the infra-red radiation is reflected onto the phototransistor of U1, causing it to become forward biased. Base current is thus diverted from Q1, which "turns off". Current can now flow through LED1, illuminating the "level" indicator.

The circuit of Fig.4 operates in a similar manner, except that there is no need for a voltage divider/rectifier section.

70 Figure 6 shows the sensor module connected to the drill circuit.

While specific embodiments of the invention have been shown and described to illustrate the inventive principles, it will be understood that the invention may be embodied otherwise, without departing from such principles.

The claim defining the invention is as follows:

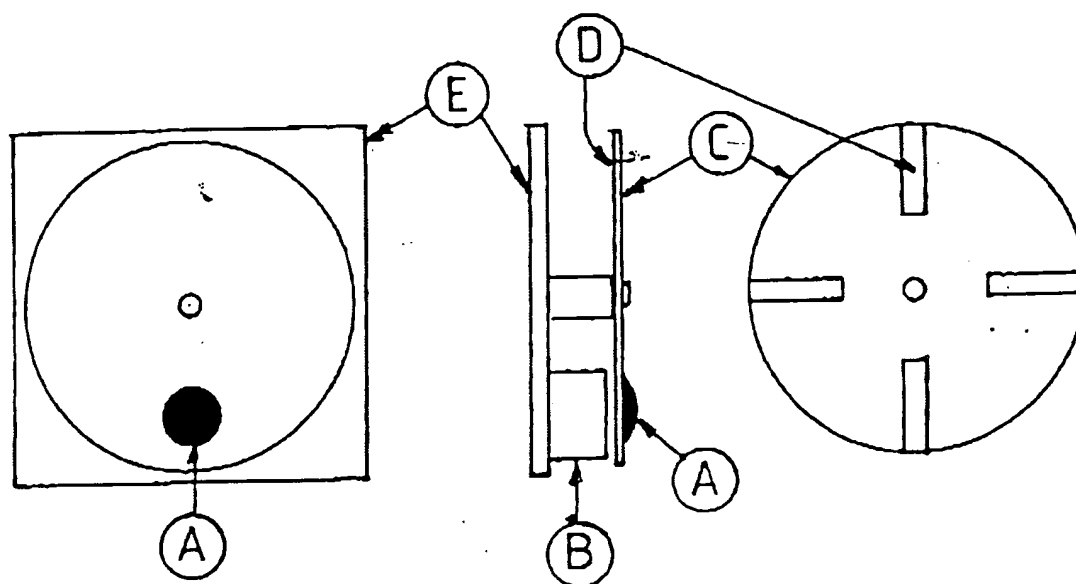
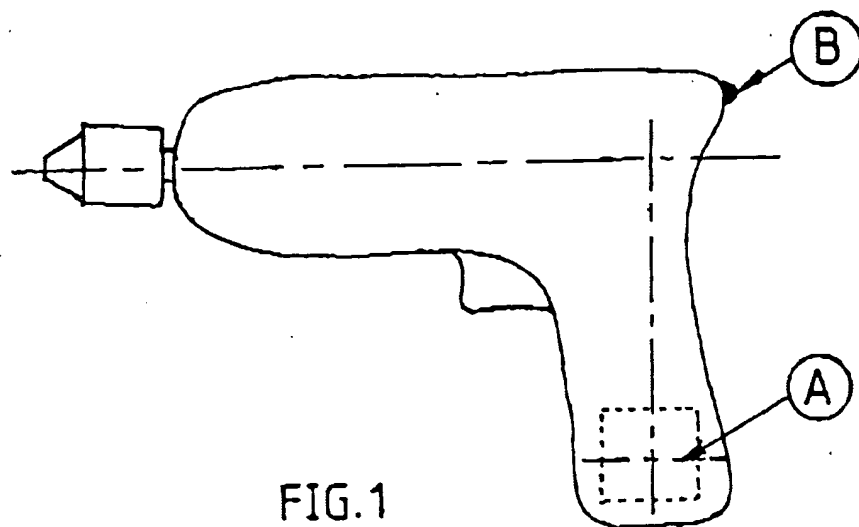
Within a portable electric drilling machine, a device utilizing an infra-red reflective electronic component forming part of an electronic circuit, and a non-reflective disc with reflective strips distributed uniformly around the circumference, the said disc, weighted to act as a pendulum and free to rotate about a pivot indirectly fixed to the drill body, remaining in a fixed attitude relative to the earth's surface, moves relative to the said infra-red reflective component of the electronic circuit, causing a light emitting diode to be illuminated whenever one of the said reflective strips passes in close proximity to the said infra-red reflective component.

Dated this 18th day of August, 1983.

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(BLOCK LETTERS)

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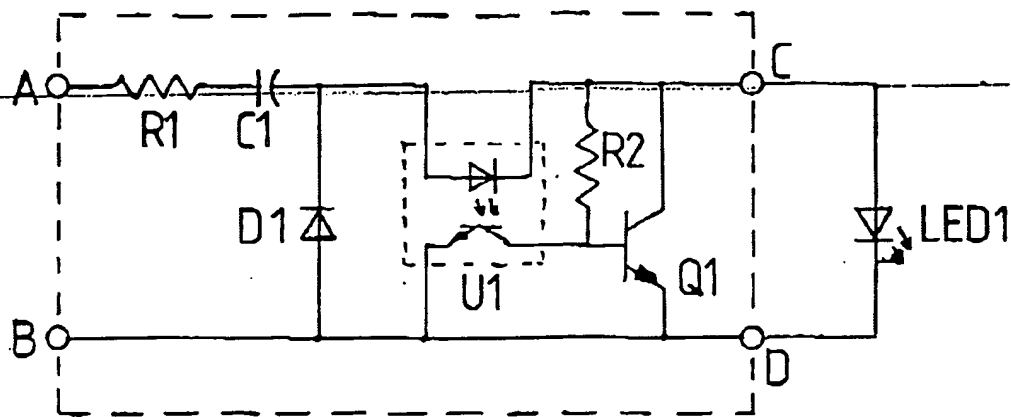


FIG. 3

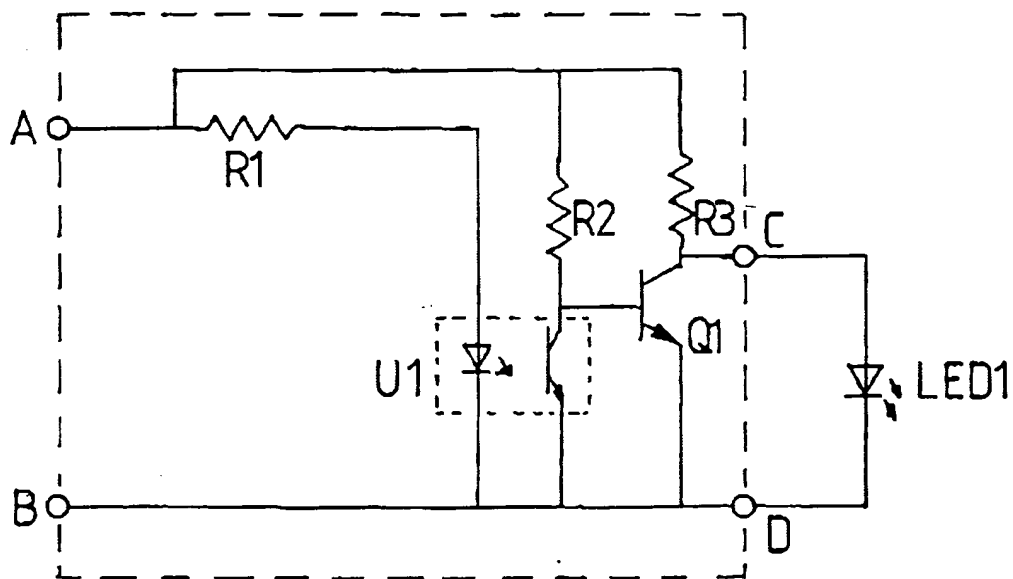


FIG. 4

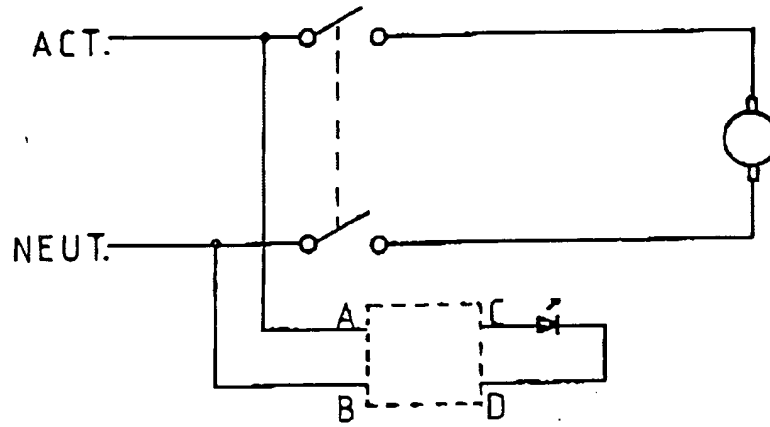


FIG. 6



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